

3,947,764

apparatus test the characteristics of rotors for hysteresis motors. A rotor to be tested is placed in predetermined spaced relation adjacent a testing stator having a stator winding. Predetermined voltage at predetermined frequency is applied to the testing stator winding while the rotor is maintained at standstill. Preferably, such voltage and frequency are the rated voltage and frequency of the motor into which it is intended that the rotor being tested will be assembled. The current thereby produced in the stator winding is measured, and the measured current is compared with a predetermined reference. The reference is preferably the current measured in the testing stator winding under the same conditions using a reference rotor that has been tested in a running motor.

8 Claims, 2 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

BRIEF SUMMARY:

(1) The invention relates to

*predetermined speed =  $\phi$*

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ge comparator circuit 24, the constant current comparator circuit 28 and the accept/reject display circuit 26.

(4) In the method of operation of the test apparatus 10, a constant voltage from the power supply 12 is supplied through the constant voltage-constant current switch 18 to the terminals of a permanent magnet DC motor 20 under test. This constant voltage is applied to the motor for a first predetermined time interval, and the current sensor 16 senses the amount of current flowing through the motor during this first time interval. The constant voltage comparator circuit 24 during this first predetermined time interval compares a voltage signal, proportional to the current flow through the motor, with a predetermined voltage reference level. If at any time during the first predetermined time interval the current flow through the motor falls below that represented by the predetermined voltage reference level, then a memory device within the comparator circuit 24 is set to store an electrical signal indicative of the fact that this has occurred. At the end of the first predetermined time interval, the constant voltage-constant current switch is caused by the timing circuit 22 to disconnect the constant voltage power supply from the motor. The motor, which will have been rotating, is allowed to come to a rest.

(5) The timing circuit 22 then causes the constant voltage-constant current switch 18 to connect the constant current power supply 14 to the motor 20 under test to cause a constant current to flow through it. Once the voltage across the terminals of the motor has reached a thresho

) Turning to FIG. 2, a more detailed block diagram of the electric motor monitoring circuit in accordance with the present invention is illustrated having the electric motor monitoring circuit 10 having the phase monitoring circuit 25 composed of four sections. The phase detector 25 is connected through the conductors 29 to the three phase motor supply lines 12 and are connected to the phase detector 32. The phase detector detects and translates all normal phase and phase error conditions from the motor supply lines 12 into voltages that are evaluated in a comparator circuit 33. The comparator section is a window comparator circuit that compares the voltage from the phase detector to two reference voltages, one reference voltage is higher and the other is lower than the phase detector voltage under normal phase conditions. If phase errors occur, the voltage from the phase detector will be above or below the reference voltages and cause the OPTO section 34 to deenergize. The OPTO section isolates the phase monitor three phase power operation from the insulation tester 14 voltage environment while allowing the control signal from the phase monitor to control a section of the insulation testers circuitry. This deactivates the normally ON relay 24 that will interrupt the voltage path of the insulation tester's 14 motor start relay coil 9. The reference voltages create a range of voltages or window of operation that the phase detector 32 voltage can vary about and still not cause a phase error condition. Hysteresis is provided so that there will be a dead zone between the normal operation and the phase error conditions so that small line variations will be canceled out.

(5) A delay circuit 35 provides a time delay before a phase error condition is declared. This is primarily to avoid nuisance dropouts

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oil which  
generates a sinusoidal voltage whose frequency is a  
function of speed of  
rotation of the spin rotor. This signal is fed to a  
precision tachometer  
circuit whose output is compared with a desired speed  
signal for generating a  
voltage required to maintain a proper spin rate and  
comprises what is referred  
to as a "sustain" voltage. The sustain voltage is buffered  
and coupled to an  
external test point which can be monitored to determine the  
functional  
integrity of the gyro and more particularly the quality of  
its motor bearings.  
This sustain voltage is also coupled to drive amplifier  
circuit means which  
power the head coil assembly including drive windings of  
the spin motor.  
Circuitry is also provided for performing an automated  
spin-up and spin-down  
test.

19 Claims, 2 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

GOVT-INTEREST:

ORIGIN OF THE INVENTION This invention was made by an  
employee of the United  
States Government. Accordingly, the Government may  
practice the invention  
without payment

ower converter has three parallel legs, each including two series connected gate-turn-off thyristors (GTO) connected between a pair of DC power source buses. A microprocessor controls the test sequence in which each GTO is individually turned on in a predetermined order so as to create a transient snubber current through the motor and through each GTO when it is turned on. The snubber current and a voltage in each leg is measured and compared to a respective reference to detect wiring errors, and defects in the motor, the GTOs, and other system components. Error messages are generated in response to detection of abnormalities or defects.

5 Claims, 10 Drawing figures

Exemplary Claim Number: 5

Number of Drawing Sheets: 10

#### BRIEF SUMMARY:

(1) BACKGROUND OF THE INVENTION

(2) This invention relates generally to an apparatus and method for testing AC motor power sys